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ABSTRACT

Adequate financial support for research and development (R&D) activities at universities and colleges in the United States is essential for enabling academic researchers to perform world-class research. This brief focuses on the main sources of financial support for academic R&D and the changes that have taken place over the last two decades. Discussed are overall sources of support (Federal Government, institutional funds, state and local governments, industrial sector, other sources) and sources of support by science and engineering field. (CCM)

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What Are the Sources of Funding for Academically Performed R&D?

By Alan I. Rapoport

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NATIONAL SCIENCE FOUNDATION
Directorate for Social, Behavioral, and Economic Sciences

by Alan I. Rapoport

Division of Science Resources Studies

ISSUE BRIEF

December 23, 1998

WHAT ARE THE SOURCES OF FUNDING FOR ACADEMICALLY PERFORMED R&D?

The federally financed share of academic R&D had been declining during the 1970s and 1980s but stabilized at around 60 percent in the 1990s.

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Adequate financial support for research and development (R&D) activities at U.S. universities and colleges is essential in enabling academic researchers to carry out world-class research. Such support comes from a number of sources whose relative contribution has been changing over the past several decades. Changes in support patterns tend to raise concern in the academic science and engineering community about potential impacts on overall academic R&D activities. This Issue Brief focuses on the main sources of financial support for academic R&D and the changes that have taken place over the past two decades.[1]

Overall Sources of Support

The *Federal Government* provides the majority of funds for R&D performed in academic institutions.[2] In 1998, it accounted for 59 percent of the estimated funding for academic R&D. The federally financed share had been declining fairly steadily from 1970 until the beginning of the 1990s, dropping from 70 percent in 1970 to 58 percent in 1991. Since then, it has fluctuated between 59 and 60 percent (figure 1).

Institutional funds[3] constitute the second largest source of academic R&D funding. The major sources of institutional R&D funds are (1) general-purpose state or local government appropriations, particularly for public institutions; (2) general-purpose grants from industry, foundations, or other outside sources; (3) tuition and fees; (4) endowment income; and (5) gifts that are not restricted to research by the donor. Other potential sources of institutional funds are income from patents or licenses and income from patient care revenues. The share of support represented by institutional funds has been increasing fairly steadily since 1970. In that year, institutional funds accounted for about 11 percent of all academic R&D expenditures; the estimated 1998 share is just over 19 percent.[4]

The share of academic R&D funding provided by *state and local governments* declined from 10 to 8 percent between 1970 and 1980, stayed around the 8 percent level between 1980 and 1991, and declined further during the 1990s, nearly reaching an estimated 7 percent in 1998. This share, however, only reflects funds directly targeted to academic R&D activities and does not include general-purpose state or local government appropriations that may be used for separately budgeted research or to cover unreimbursed indirect costs or cost sharing. Consequently, the actual contribution of state and local governments to academic R&D will be understated, particularly for public institutions.

The funds provided for academic R&D by the *industrial sector* grew faster than did funding from any other source during the past three decades, although they still account for one of the smallest shares of funding. Industry increased its share from

[1] For a fuller discussion of academic R&D, see National Science Board, *Science and Engineering Indicators—1998*, NSB-98-1 (Washington, DC: U.S. Government Printing Office, 1998), Chapter 5.

[2] The academic R&D funding reported here includes only separately budgeted R&D and institutions' estimates of unreimbursed indirect costs associated with externally funded R&D projects, including mandatory and voluntary cost sharing. It does not include departmental research, and thus excludes funds—notably for faculty salaries—in cases where research activities are not separately budgeted.

[3] Institutional funds are separately budgeted funds that an academic institution spends on R&D from unrestricted sources, unreimbursed indirect costs associated with externally funded R&D projects, and mandatory and voluntary cost sharing on Federal and other grants.

[4] Some of the growth in institutional R&D funds may be due to accounting changes, including both a shift of departmental research to separately budgeted research and increased institutional ability to calculate unreimbursed indirect costs, including mandatory and voluntary cost sharing.

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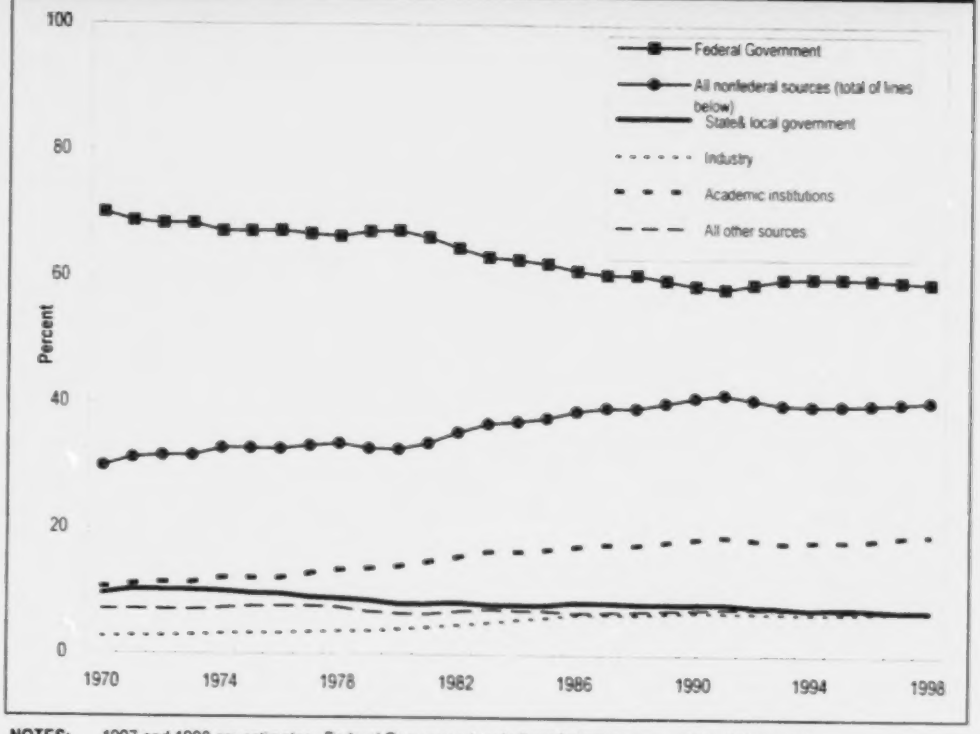
Although industry R&D support to academia grew faster than funds from any other source, industry accounts for only 7 percent of the total.

Figure 1. Sources of academic R&D funding: Shares 1970-98



NOTES: 1997 and 1998 are estimates. Federal Government and all nonfederal sources add to 100 percent.
SOURCES: National Science Foundation/Division of Science Resources Studies, Survey of Scientific and Engineering Expenditures at Universities and Colleges and *National Patterns of R&D Resources: 1998*, forthcoming (Arlington, VA: 1998)

slightly below 3 percent in 1970 to about 4 percent in 1980 and about 7 percent in 1990, where it has remained since. Industry's contribution to academia represented an estimated 1.3 percent of all industry-funded R&D in 1998, compared to 0.8 percent in 1980 and 0.6 percent in 1970. However, this relative contribution has not grown since 1994.[5]

Other sources of support include grants for R&D from nonprofit organizations and voluntary health agencies, gifts from private individuals that are restricted by the donor to research, and all other sources restricted to research purposes and not included in the other categories. This source of academic R&D support has stayed fairly constant at about 7 percent during the past three decades.

These various funding sources often have different research priorities. The Federal sector primarily supports basic research at academic institutions—72 percent of its estimated 1998 funding went to basic versus 20 percent to applied research. Nonfederal sources, on the other hand, provide a somewhat larger share of their estimated 1998 support for applied research (63 percent for basic and 30 percent for applied research). As a consequence of this differential emphasis, 63 percent of the basic research performed at universities and colleges is supported by the Federal Government while only 49 percent of the applied research is so supported.[6]

[5] See National Science Foundation/Division of Science Resources Studies, *National Patterns of R&D Resources: 1998*, forthcoming (Arlington, VA: 1998).

[6] For more details and the latest data on academic R&D performance by type of R&D performed and sources of funds, see National Science Foundation/ Division of Science Resources Studies, *National Patterns of R&D Resources: 1998*, forthcoming (Arlington, VA: 1998).

Sources of Support by Broad S&E Field

The distribution of Federal and nonfederal funding of academic R&D varies by science and engineering (S&E) field[7] (table 1). In 1996, for example, the Federal Government financed close to 80 percent of academic R&D expenditures in both physics and the atmospheric sciences; and about 70 percent in chemistry, oceanography, mathematics and statistics, the computer sciences, psychology, aerospace engineering,

Table 1. Percentage of academic R&D funds federally financed, by field: 1976-96 (even years)

Field	1976	1978	1980	1982	1984	1986	1988	1990	1992	1994	1996
	Percentages										
Total S&E	67.4	66.1	67.6	65.1	63.0	61.4	60.9	59.2	58.9	60.2	60.1
Total Sciences	67.4	65.9	67.4	64.8	62.8	61.7	61.3	59.5	59.3	60.3	60.0
Physical Sciences	80.5	79.0	81.9	78.9	78.1	76.4	74.5	72.8	71.8	72.0	72.5
Astronomy	69.8	71.6	75.6	70.6	66.1	68.5	66.1	66.1	66.5	67.6	66.4
Chemistry	77.0	75.4	77.7	74.7	75.1	72.1	71.3	68.7	66.1	68.5	69.9
Physics	85.3	84.7	86.8	83.5	82.3	80.9	78.4	77.5	76.9	76.3	76.8
Other Physical Sciences	77.2	69.7	78.7	81.2	80.1	75.8	74.7	71.8	67.7	70.8	70.5
Geosciences	73.4	72.5	73.1	70.1	69.1	66.6	65.9	63.8	63.7	67.4	67.2
Atmospheric Sciences	NA	NA	84.1	79.9	80.7	81.2	81.2	75.7	72.1	79.5	78.9
Earth Sciences	NA	NA	69.7	64.9	61.4	58.3	59.3	57.7	57.7	58.9	59.3
Oceanography	NA	NA	77.6	77.4	76.4	74.3	71.6	69.4	71.6	71.1	70.0
Other Geosciences	73.4	72.5	59.1	53.5	54.0	50.3	49.8	51.0	51.6	66.7	65.6
Mathematics and Statistics	77.4	75.1	78.4	74.5	75.0	75.5	75.4	72.6	74.0	72.9	72.4
Computer Science	74.0	61.1	70.4	74.2	72.7	72.4	70.8	66.5	68.4	71.4	72.4
Life Science	65.7	64.1	64.9	62.4	60.1	59.3	59.6	58.3	58.0	58.7	58.2
Agricultural Sciences	29.7	29.8	30.9	29.5	28.2	26.8	27.4	26.1	27.6	29.9	29.5
Biological Sciences	73.5	73.0	74.0	71.4	69.5	67.4	66.8	64.5	64.7	65.5	64.6
Medical Sciences	75.5	73.1	74.4	72.0	67.6	66.6	65.5	64.3	62.7	62.7	62.9
Other Life Sciences	72.6	70.4	67.3	64.0	62.9	61.3	61.7	59.1	58.2	58.9	55.9
Psychology	76.2	71.4	73.3	68.1	67.4	67.0	65.9	64.8	65.4	67.6	68.2
Social Sciences	52.7	50.6	53.8	45.6	39.8	37.4	34.2	32.2	34.5	37.7	38.7
Economics	44.5	46.9	48.8	43.7	39.1	33.5	30.2	27.1	29.8	31.3	33.6
Political Science	42.2	43.4	43.4	37.3	33.9	29.4	29.0	22.0	24.7	30.9	33.8
Sociology	62.1	60.7	65.0	58.5	54.0	51.2	44.1	45.5	50.0	49.4	52.0
Other Social Sciences	54.8	49.4	54.1	42.8	35.3	35.8	34.4	33.9	34.2	38.7	36.7
Other Sciences	59.5	58.1	53.6	56.5	48.5	47.1	41.9	41.1	32.4	36.4	41.2
Total Engineering	67.3	67.8	68.6	67.2	64.0	59.6	58.7	57.4	57.2	59.6	60.3
Aerospace Engineering	NA	NA	79.5	79.1	78.2	77.0	76.3	77.7	76.7	75.7	73.1
Chemical Engineering	NA	NA	64.4	62.0	59.1	55.4	52.6	50.6	48.4	54.1	55.0
Civil Engineering	NA	NA	64.0	51.5	51.8	49.6	45.6	41.2	42.3	41.0	43.7
Electrical Engineering	NA	NA	75.7	77.1	71.0	65.9	64.9	65.1	63.9	66.0	67.6
Mechanical Engineering	NA	NA	67.0	68.3	66.5	64.9	63.5	61.0	59.7	65.5	65.3
Materials Engineering	NA	NA	NA	NA	NA	NA	NA	50.9	48.7	50.2	52.8
Other Engineering	67.3	67.8	65.7	65.3	61.1	54.6	54.9	54.6	57.5	60.3	60.2

NA = Not available

SOURCES: National Science Foundation/Division of Science Resources Studies, Survey of Scientific and Engineering Expenditures at Universities and Colleges; CASPAR Database System (http://caspar.nsf.gov/webcaspar/).

[7] Data are not available on specific nonfederal sources by S&E field.

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and electrical engineering. In contrast, it supported only 34 percent of academic R&D in economics and political science and 30 percent in the agricultural sciences. The declining Federal share in support of academic R&D over the past couple of decades is not limited to particular S&E disciplines. Rather, the federally financed proportion of support for *each* of the broad S&E fields was lower in 1996 than in 1976 (table 1). The most dramatic decline occurred in the social sciences (53 percent in 1976 versus 39 percent in 1996); the smallest decline was in the computer sciences (74 to 72 percent). The long-term decline also holds for most of the more detailed S&E fields, with a fall in share by more than 10 percent for the earth sciences, medical sciences, economics, sociology, and civil engineering.[8] However, many of these fields have experienced slight increases in Federal share during the first half of the 1990s.

[8]Data were not collected until 1980 for detailed fields within engineering and for the atmospheric, earth, and oceanographic sciences.

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